What is claimed is:

1. A method for adaptively allocating resource in a communication system by subsequently processing sub-carrier/time slot allocation and modulation method selection, the method comprising the steps of:

a) computing average channel gains of sub-carriers/time slots for each user by using channel gains of sub-carriers/time slots for each user;

b) computing average numbers of bits for each user by using required data rates and average channel gains of sub-carriers/time slots for each user;

c) computing the number of sub-carriers/time slots allocated to each user and allocating the sub-carriers/time slots to each user; and

d) selecting a modulation method with respect to each sub-carrier/time slot.

2. The method as recited in claim 1, wherein the average channel gain of each user in the step a) is computed by using an equation as:

$$\overline{\alpha_k}^2 = \frac{1}{N}\sum_{n=1}^{N} \alpha^2{}_{k,n}, \quad \text{for} \quad k = 1.....K$$

wherein $\overline{\alpha_k}^2$ is the average channel gain of sub-carrier for each user and $\alpha^2{}_{k,n}$ is the channel gain of sub-

carrier/time slot for each user.

3. The method as recited in claim 1, wherein the average number of bits for each user in the step b) is a solution of K+1 non-linear equations formulated by an equation as:

$$\frac{\bar{c}_k f'(\bar{c}_k) - f(\bar{c}_k)}{\overline{\alpha_k}^2} = \varepsilon, \quad \text{for } k=1,\ldots,K$$

$$\sum_{k=1}^{K} R_k / \bar{c}_k = N$$

wherein $\bar{c}_k$ is an average number of bits for each user, $f(c)$ is a power to receive c bits data within a range of bit error rate, and R_k is the total number of bits for each user.

4. The method as recited in claim 1, wherein the number of sub-carriers/time slots in the step c) is computed by using an equation as:

$$n_k = R_k / \overline{c_k}, \quad \text{for } k=1,\ldots,K$$

wherein, n_k is the number of allocated sub-carriers/time slots for each user.

5. The method as recited in claim 1, wherein the allocation of sub-carrier/time slot in the step c) is an optimal solution of an equation as:

$$\text{Minimize } P_i - \sum_{k=1}^{K}\sum_{n=1}^{N} r_{k,n}\rho_{k,n}$$

$$\text{Subject to } \sum_{n=1}^{N}\rho_{k,n} = n_k \text{, for all } k$$

$$\sum_{k=1}^{K}\rho_{k,n} = 1\text{, for all } n$$

wherein $\rho_{k,n}$ is a variable number which determines whether a K-th user uses an n-th sub-carrier and $r_{k,n}$ is a cost for the K-th user to use the n-th sub-carrier.

6. The method as recited in claim 5, wherein the cost for the K-th user to use the n-th sub-carrier is determined by an equation as:

$$r_{k,n} = f(\overline{c_k}) / \alpha^2{}_{k,n}\text{, for } k = 1,\ldots,K \text{ and } n = 1,\ldots,N\text{ .}$$

7. The method as recited in claim 5, wherein a linear optimal solution is solved by applying a Vogel's method.

8. A computer readable recording medium for storing instructions for executing a method for adaptively allocating resource in a communication system including a microprocessor by subsequently processing sub-carrier/time

slot allocation and modulation method selection, comprising the methods of:

a) computing average channel gains of sub-carriers/time slots for each user by using channel gains of sub-carriers/time slots for each user;

b) computing average numbers of bits for each user by using required data rates and average channel gains of sub-carriers/time slots for each user;

c) computing the number of sub-carriers/time slots allocated to each user and allocating the sub-carriers/time slots to each user; and

d) selecting a modulation method with respect to each sub-carrier/time slot.